

United States
Department of
Agriculture

Forest Service

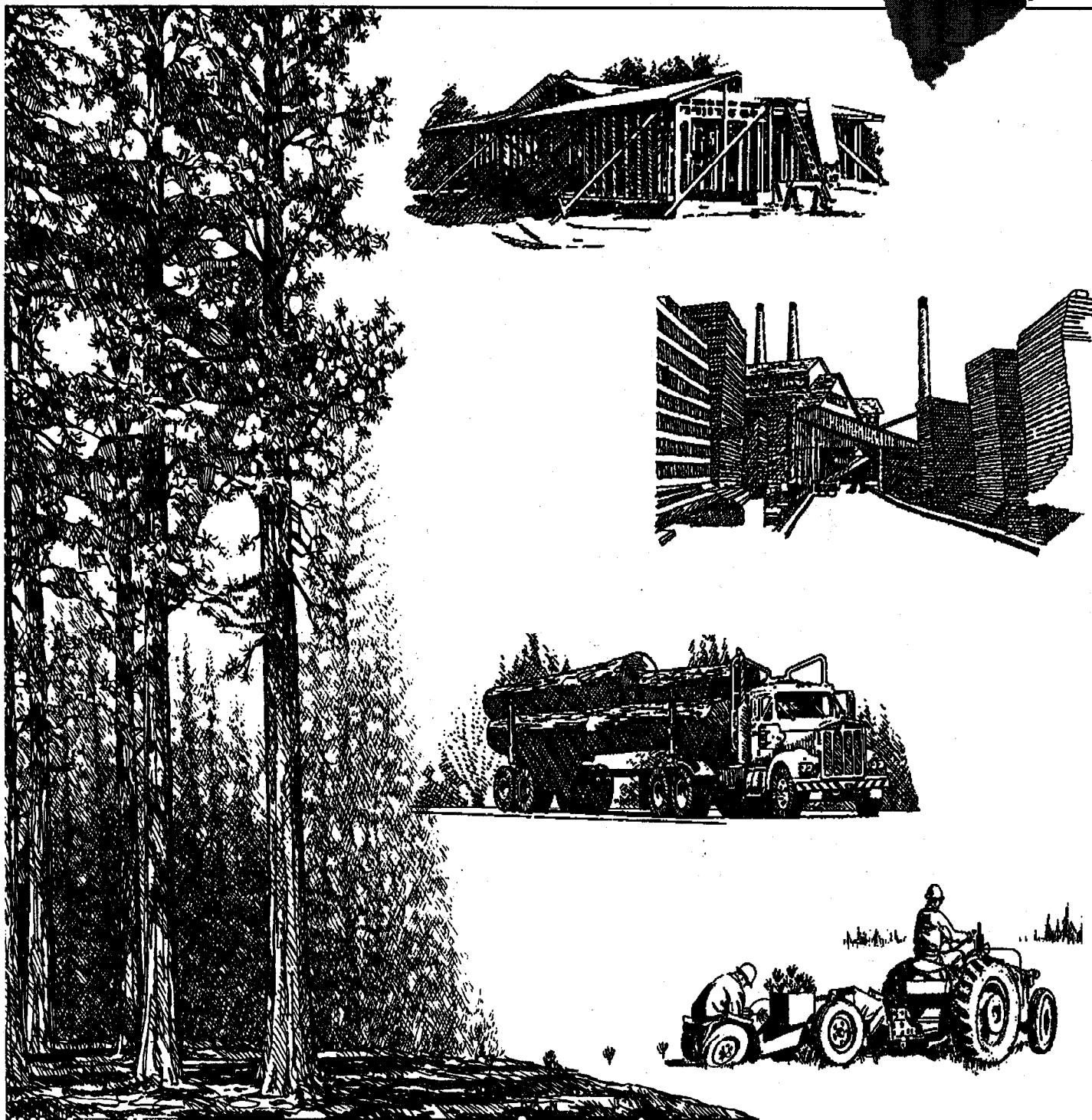


Southern Research
Station

Resource Bulletin
SRS-7

South Carolina's Timber Industry — An Assessment of Timber Product Output and Use, 1994

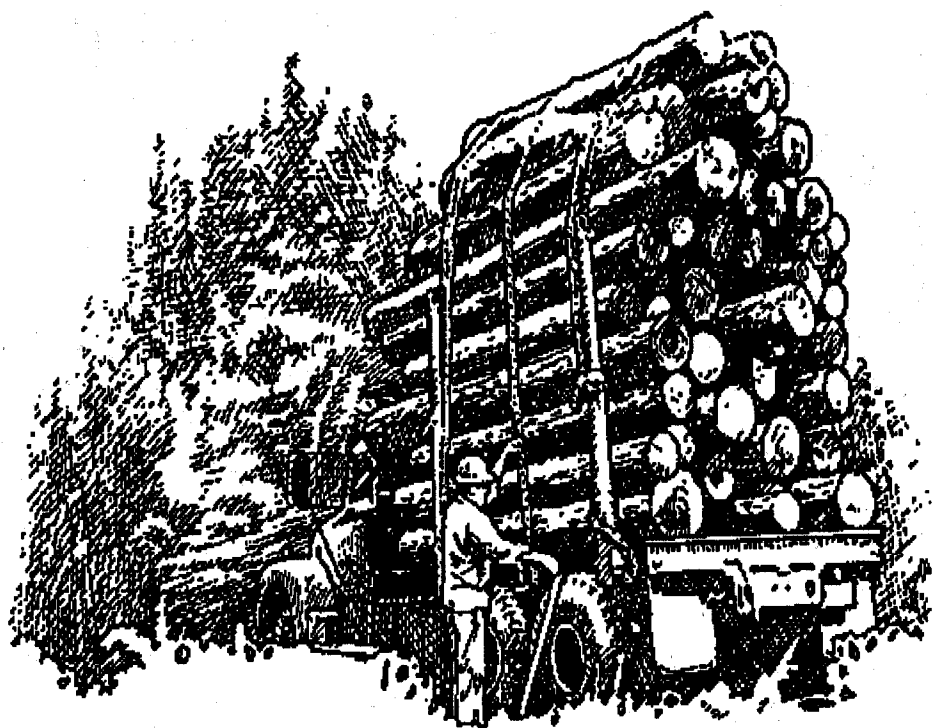
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Foreword

This report contains the findings of a 1994 canvass of all primary wood-using plants in South Carolina and presents changes in product output and residue use since 1992. It complements the Forest Inventory and Analysis periodic inventory of volume and removals from the State's timberland. The canvass was conducted to determine the amount and source of wood receipts and annual timber product drain by county in 1994 and to determine interstate and cross-regional movement of industrial roundwood. Only primary wood-using mills were canvassed. Primary mills are those that process roundwood in log or bolt form or as chipped roundwood. Examples of industrial roundwood products are saw logs, pulpwood, veneer logs, poles, and logs used for composite board products. Mills producing products from residues generated at primary and secondary processors were not canvassed. Trees chipped in the woods were included in the estimate of timber drain only if they were delivered to a primary domestic manufacturer.

A 100-percent canvass of all wood-processors in South Carolina was conducted in 1995 for 1994. Out-of-State mills known to be using logs or bolts harvested from South Carolina timberland were also contacted. Each mill was canvassed by mail or through personal contact at plant locations. Telephone contacts

followed mailed questionnaire responses when additional information or clarification of response was necessary. In the event of a nonresponse, data collected in previous surveys were updated by current data collected for mills of similar size, product type, and location. Surveys for all timber products other than pulpwood began in 1957 and are currently conducted every year.

Pulpwood production data were taken from an annual canvass of all southeastern pulpmills, conducted annually in cooperation with the American Pulpwood Association. Medium-density fiberboard, insulating board, and hardboard plants were included in this survey.

The Southern Research Station gratefully acknowledges the cooperation and assistance provided by the South Carolina Forestry Commission, and the Cooperative Extension Service, Clemson University in collecting mill data and to forest industry and mill managers for providing timber products information. The information in this report is based on responses from 80 percent of mills operating in 1994: 8 pulpmills, 9 of the 14 veneer mills, 7 mills manufacturing other industrial products, and 80 of the 78 sawmills. They accounted for 92 percent of the 1994 mill receipts.



South Carolina's Timber Industry— An Assessment of Timber Product Output and Use, 1994

Output of Industrial Timber Products

Timber production and the wood products industry ranks third in South Carolina behind textiles and chemical manufacturing in economic importance, according to the South Carolina Forestry Commission. Between 1992 and 1994, the combined output of industrial roundwood timber products and plant byproducts increased 11 percent to 0.9 billion cubic feet. Timber product output (TPO) from roundwood was up nearly 71 million cubic feet to 653 million cubic feet. Output from plant byproducts increased 17 million cubic feet to 21 million cubic feet and accounted for 24 percent of total output (table 1). Output of softwood roundwood products increased 9 percent to 515 million cubic feet, 79 percent of South Carolina's total output of roundwood timber products (fig. 1). Hardwood roundwood production increased 25 percent to 138 million cubic feet.

Pulpwood and saw logs were the principal roundwood products in 1994. Combined output for these two products amounted to 599 million cubic feet, 91 percent of the State's total roundwood output (fig. 2).

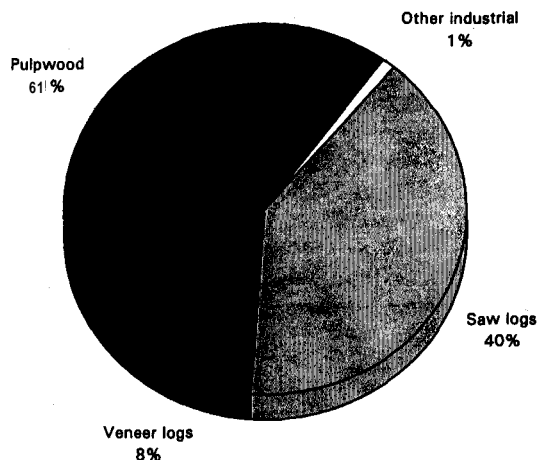


Figure 2—Roundwood production, by type of product, 1994.

Saw Logs

Saw-log production in South Carolina accounted for 40 percent of the State's total roundwood products output in 1994. Since 1992, combined output of softwood and hardwood saw-log production was up 3 percent

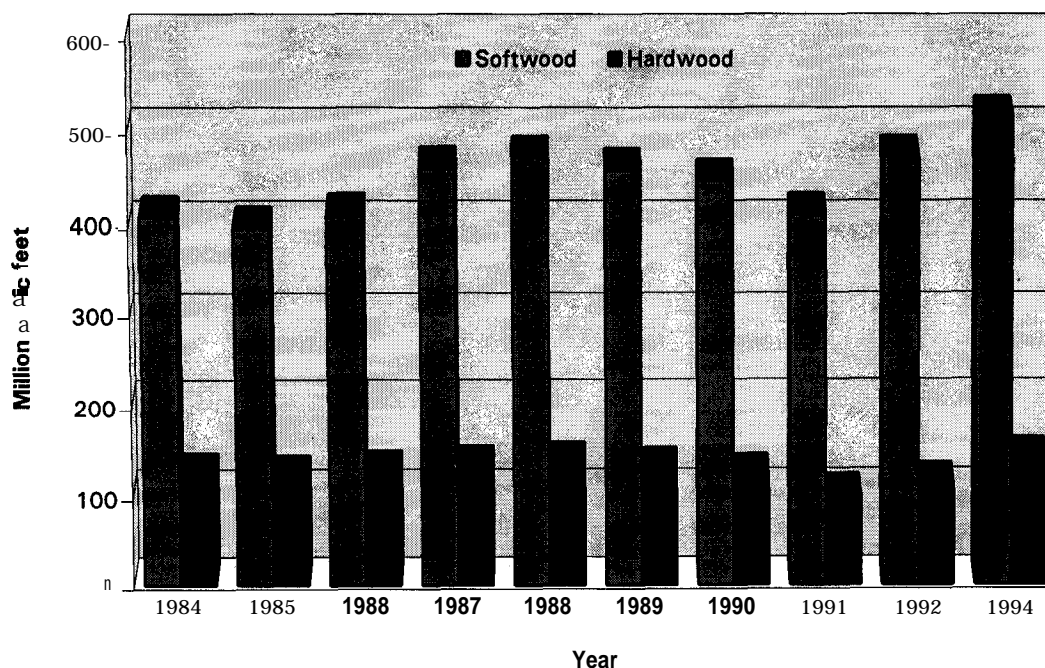


Figure 1—Roundwood production for all products, by species group and year.

and totaled 264 million cubic feet, or more than 1.5 billion board feet. This production is equivalent to the volume of lumber needed to construct about 140,000 single-family homes. Output of softwood saw logs declined almost 1 percent since 1992 and totaled 230 million cubic feet (1.3 billion board feet). Hardwood saw-log production was up 35 percent to 35 million cubic feet (0.2 billion board feet). With saw-log production at more than 40 million cubic feet in 1967 and 1978, hardwoods accounted for 28 and 24 percent, respectively. In 1994, however, hardwoods only accounted for about 13 percent of the saw-log production (fig. 3). Southern yellow pine accounted for most of the softwood saw logs harvested in the State in 1994, while hard hardwoods (primarily oaks) made up 53 percent of the hardwood saw-log output (not shown).

Pulpwood

Pulpwood production accounted for 51 percent of the State's total roundwood output and was the leading roundwood product in South Carolina, as it has been since the early 1960's. Output of pulpwood (including chipped roundwood) increased from 284 million cubic feet (4.0 million cords) in 1992 to 334 million cubic feet (4.7 million cords) in 1994. Both softwood and hardwood output increased between 1992 and 1994 (Johnson 1994). Softwood output increased by 16 percent to 238 million cubic feet, while hardwood

output was up 22 percent to 96 million cubic feet. Since 1987, hardwood has provided nearly 30 percent of the total pulpwood production in South Carolina (fig. 4). Softwoods accounted for 71 percent of South Carolina's pulpwood production in 1994, a 1 percent decline from 1992.

Veneer Logs

Output of veneer logs in 1994 totaled 50 million cubic feet, a 38-percent increase since 1992. Veneer production accounted for about 8 percent of the State's total roundwood TPO in 1994. Output of softwood veneer logs increased 42 percent to 42 million cubic feet (240 million board feet). In 1967, softwood veneer production amounted to less than 1 million cubic feet or only about 7 percent of total veneer production. By 1987, however, softwood veneer production had peaked at more than 56 million cubic feet and accounted for more than three-fourths of the veneer production (fig. 5). In 1994, softwoods accounted for about 85 percent of the State's veneer production, 2 percent more than in 1992. Output of hardwood veneer logs increased 23 percent to 8 million cubic feet (48 million board feet). Southern yellow pine accounted for nearly all of the softwood roundwood harvested for veneer, while soft hardwoods (mostly yellow-poplar and sweetgum) accounted for 88 percent of the hardwood roundwood harvested for veneer (not shown).

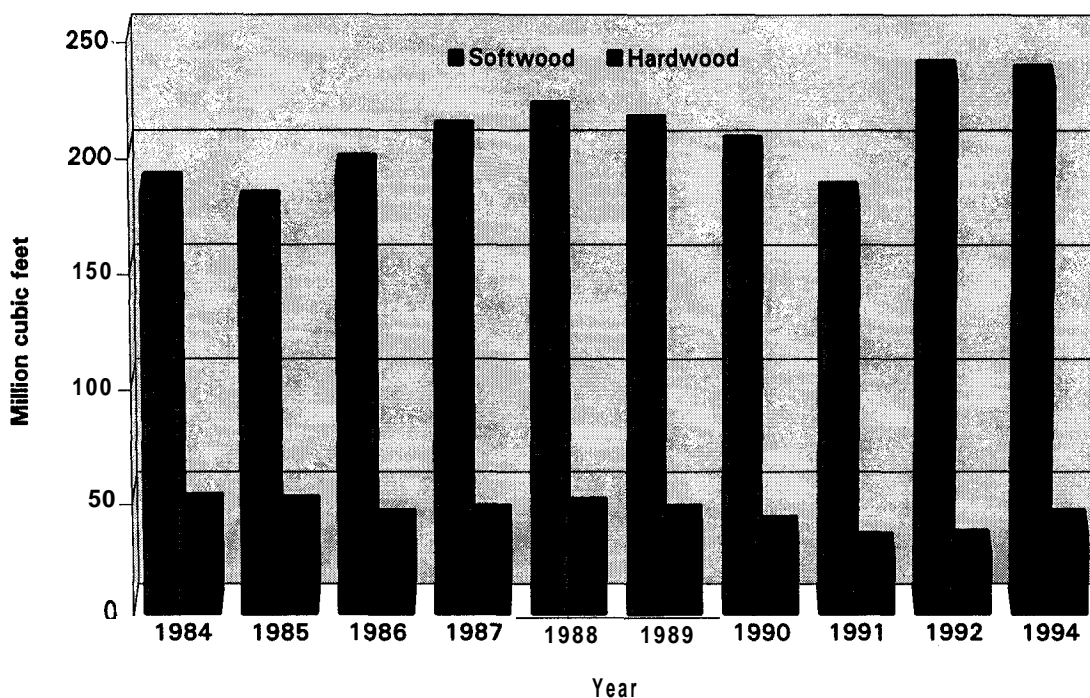


Figure 3—Roundwood saw-log production, by species group and year.

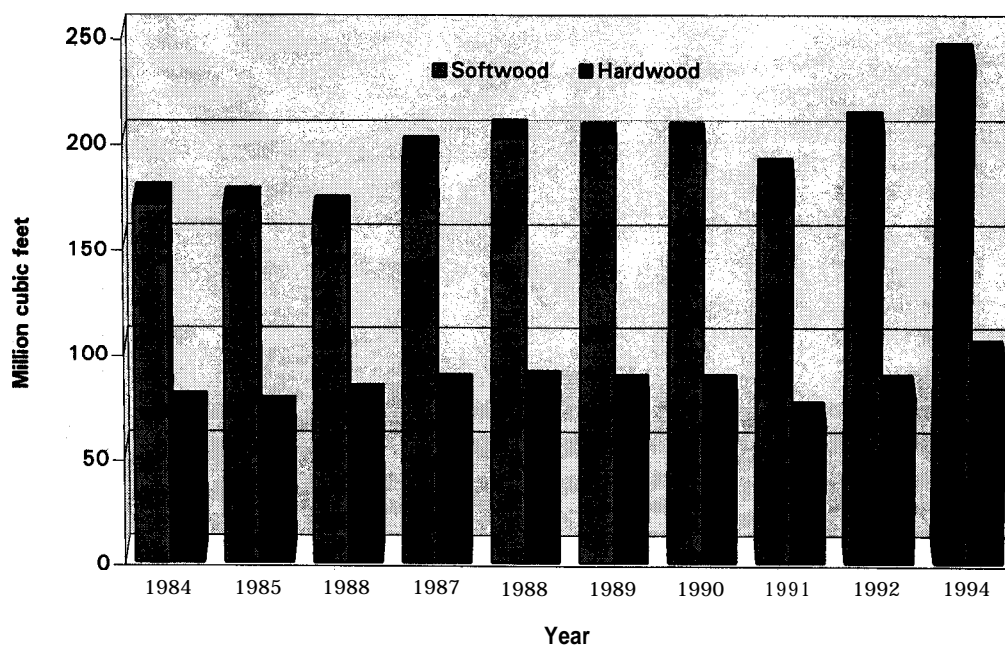


Figure 4—Roundwood pulpwood, by species group and year.

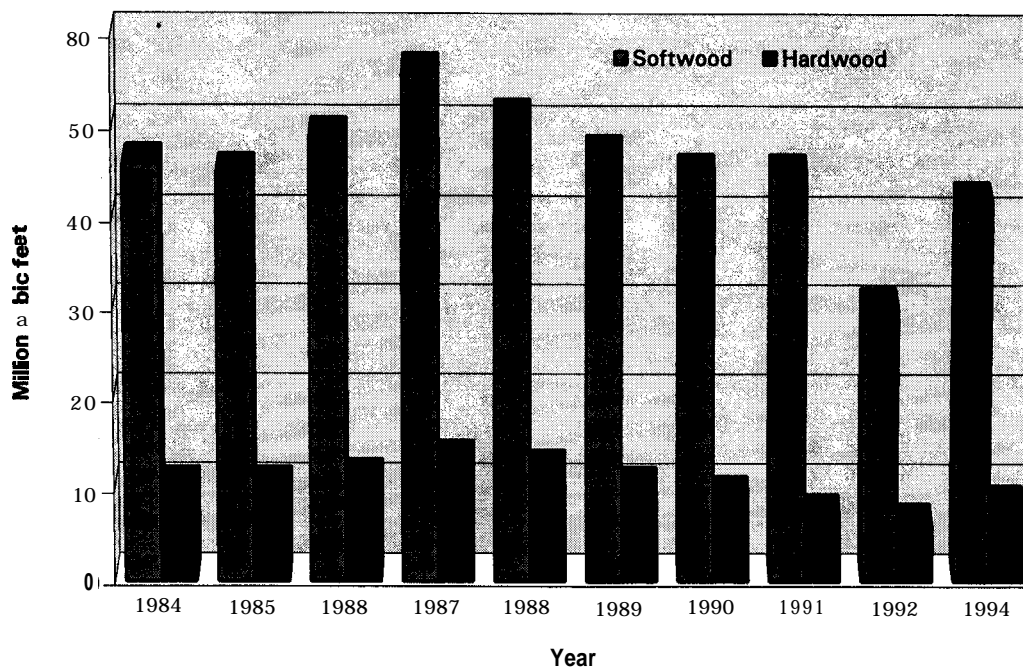


Figure 5—Roundwood veneer-log production, by species group and year.

Other Industrial Products

Roundwood harvested for other industrial uses such as poles, posts, mulch, firewood, and all other industrial products totaled 4.8 million cubic feet in 1994, a 9-percent decline since 1992. Softwoods made up all

of the industrial product volume. Roundwood used for other industrial products accounted for only 1 percent of South Carolina's total TPO in 1994.

Number of Mills and Receipts

Total receipts at South Carolina mills, which include roundwood harvested and retained in the State and roundwood imported from other States, increased 12 percent to 652 million cubic feet (table 2). The number of primary roundwood-using plants in South Carolina declined from 111 in 1992 to 105 in 1994, a 5-percent decrease (table 3). The number of primary manufacturers has remained relatively stable since 1968.

Sawmills. South Carolina had a net loss of three sawmills between 1992 and 1994. Over the same period, total saw-log receipts increased 2 million cubic feet to 251 million cubic feet, a 1-percent increase since 1992. In 1994, sawmill receipts accounted for 38 percent of total receipts. Softwood saw-log receipts increased nearly 1 million cubic feet to 222 million cubic feet, and hardwood receipts increased 5 percent to 29 million cubic feet. Yellow pine accounted for most of the State's total softwood saw-log receipts. For the 76 mills currently operating, 45 percent had receipts of less than 5 million board feet and accounted for 5 percent of total receipts. While 38 percent of the mills had receipts greater than 10 million board feet, these mills accounted for 89 percent of total receipts (table 4).

Pulpmills. Eight pulpmills were operating and receiving roundwood in 1994, one less than in 1992. The State's total pulpwood receipts were up by 18 percent to 347 million cubic feet, while the 24-hour pulping capacity for these mills declined from 11,693 tons (Miller 1994) to 11,470 tons (Johnson and Howell 1996). Both softwood and hardwood pulpwood receipts increased between 1992 and 1994. Softwood receipts were up 16 percent to 252 million cubic feet, and hardwood receipts were up 22 percent to 95 million cubic feet. Softwoods accounted for nearly three-fourths of the pulpwood receipts. Receipts of round pulpwood in 1994 accounted for 53 percent of total receipts for all mills (table 5).

Veneer Mills. The number of veneer mills operating in South Carolina remained at 14 between 1992 and 1994. At the same time, veneer receipts across the State increased 19 million cubic feet, or about 60 percent, to 50 million cubic feet. Both softwood and hardwood receipts increased in 1994. Softwood veneer log receipts were up 67 percent to 42 million cubic feet, and hardwood veneer receipts were up 31 percent to 9 million cubic feet. All softwood veneer-log receipts were southern yellow pine. Soft hardwoods (yellow-poplar and sweetgum) made up the bulk of hardwood veneer receipts. Veneer accounted for 8 percent of South Carolina's total receipts for all products.

Other Industrial Mills. Since 1992, the number of plants producing other industrial products dropped from nine to seven. At the same time, receipts at the remaining mills totaled 3.5 million cubic feet, down 1.8 million cubic feet since 1992. Current facilities include five pole mills and two post mills.

Roundwood Movement

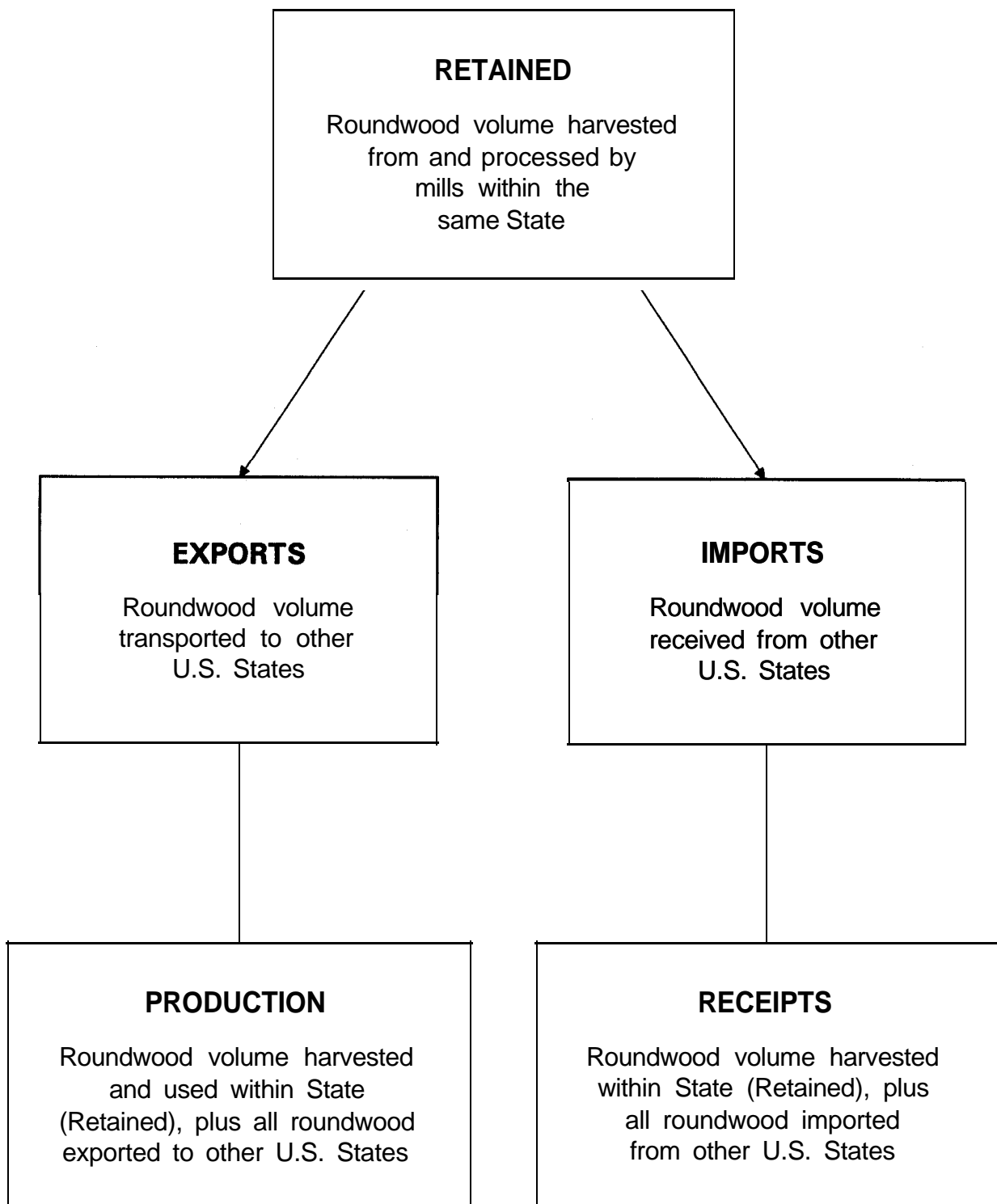
Note: To follow the logic of this section, the reader must understand that certain terms—namely, production, retained, export, import, and receipts—have specialized meanings and relationships unique to the Forest Inventory and Analysis units across the country dealing with timber products output (fig. 6).

South Carolina was a net exporter of industrial roundwood. In 1994, the State retained 538 million cubic feet, or 82 percent of its production (table 6), compared to 83 percent in 1992. Imports from other States totaled 114 million cubic feet, a 18-percent increase from 1992. Exports to mills outside South Carolina amounted to 115 million cubic feet, up 14 percent. Imports of all softwood products exceeded exports by nearly 4 million cubic feet, while hardwood exports exceeded imports by more than 5 million cubic feet.

The volume of whole trees cut or trees chipped in the woods and delivered to chip facilities for export overseas is not included in the estimate of export volume or roundwood production. Most of this volume is hardwood chips destined for wood fiber companies in Japan, Korea, and Taiwan. The result is an underestimate of hardwood volume produced or exported from South Carolina.

Roundwood pulpwood accounted for 68 percent of total known exports and 80 percent of total imports (table 7). Round pulpwood imports amounted to 91 million cubic feet, or nearly 13 million cubic feet more than was exported. Saw logs accounted for the next largest share, 15 percent, of the import total and accounted for 27 percent of the export total.

Saw Logs. South Carolina retained 88 percent of its saw-log production for domestic manufacture (table 8), down 2 percent from 1992. However, the State remains a net exporter of saw logs. Saw-log exports of 31 million cubic feet were divided among Georgia and North Carolina with 60 percent and 40 percent, respectively. Softwoods accounted for 76 percent of the saw-log exports. Over 17 million cubic feet of saw logs were imported, with softwoods making up 87 percent of the imports. South Carolina mills received saw logs primarily from North Carolina (58 percent) and Georgia (41 percent), with negligible amounts from Kentucky, Mississippi, and Tennessee.



Production = Retained + Exports

Receipts = Retained + Imports

Figure 6—Movement of roundwood exports and imports within the United States.

Veneer Logs. South Carolina retained 91 percent of its veneer-log production for processing at domestic veneer mills (table 9). Exports amounted to over 4 million cubic feet, while imports totaled 5 million cubic feet, making the State a net importer of roundwood veneer logs. Veneer exports went to North Carolina (96 percent) and Georgia (4 percent). Softwoods accounted for 88 percent of the export volume. Sources of the imports were North Carolina (71 percent) and Georgia (29 percent).

Pulpwood. South Carolina retained 77 percent of the roundwood cut for pulpwood for processing at domestic pulpmills (table 10). Imports of 90 million cubic feet exceeded exports by 16 percent, making the State a net importer of pulpwood. Imports came from North Carolina (98 percent), Georgia (1 percent), and negligible amounts from Alabama, Mississippi, and Virginia. Exports of 78 million cubic feet went primarily to Georgia (65 percent), North Carolina (34 percent), and negligible amounts to Arkansas, Florida, Kentucky, Ohio, and Pennsylvania.

Composite Panel. All 44 thousand cubic feet of roundwood production harvested for composite panels were exported to North Carolina for processing (table 11). There were no imports into the State because no composite panel mills operated in South Carolina in 1994.

Other Industrial. South Carolina was also a net exporter of roundwood used for other industrial products (table 12). Sixty-seven percent of roundwood harvested for other industrial products was retained for processing within the State. All 0.3 million cubic feet imported was softwood and came from North Carolina (65 percent) and Georgia (35 percent). All 1.6 million cubic feet exported out of State was also softwood and went to Georgia (85 percent), North Carolina (15 percent), and a negligible amount to Virginia.

Plant Byproducts

In 1994, processing of primary products in South Carolina mills generated 211 million cubic feet of wood and bark residues (table 13). Coarse residues from all primary products amounted to 77 million cubic feet, while bark volume totaled 65 million cubic feet. Collectively, sawdust and shavings totaled 69 million cubic feet, or 33 percent of total residues (fig. 7). Of the mill residues generated, 84 percent came from softwoods and 16 percent came from hardwoods. More than 99 percent of the softwood and hardwood residues generated became products or industrial fuel (fig. 8). Nearly 70 million cubic feet, or 91 percent of the coarse residues, were used for fiber products, while 4 million cubic feet were used for industrial fuel. The remainder was used for sawn products, particle-

board, and other miscellaneous products (table 14). Most of the bark was used for industrial fuel or other miscellaneous products. Sixty-four percent of the sawdust and shavings were used for industrial fuel, 26 percent for particleboard, and 10 percent for other miscellaneous products.

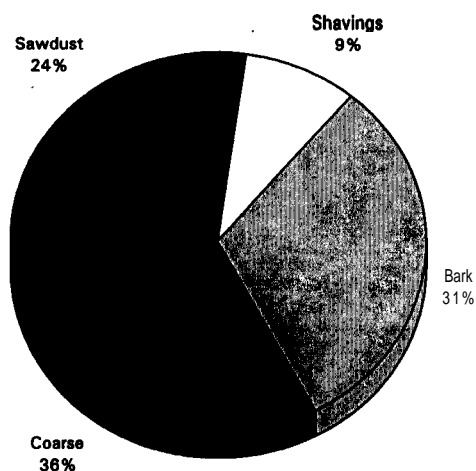


Figure 7-Primary mill residue, by residue type.

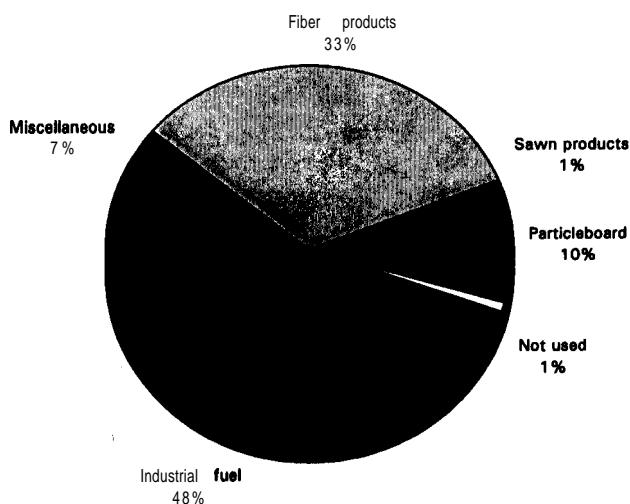


Figure 8-Disposal of residue, by product.

Saw Logs. In 1994, sawmills generated more than 140 million cubic feet of mill residues, accounting for 67 percent of total residues produced (fig. 9). About 97 percent of the 62 million cubic feet of coarse residues from saw logs was used for fiber products. Bark and sawdust generated amounted to more than

60 million cubic feet and were used primarily for industrial fuel and miscellaneous products. Shavings from dressed lumber totaled 18 million cubic feet. Sixty-seven percent of the shavings was used for particleboard.

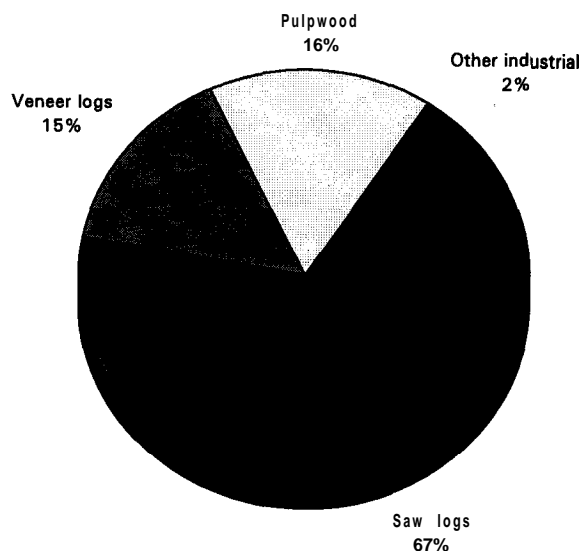


Figure 9—Primary mill residue, by residue type.

Veneer Logs. Veneer mills generated 31 million cubic feet of residues in 1994, 15 percent of the State's total primary mill residue volume. Nearly 86 percent of the 14 million cubic feet of coarse veneer residues were used for fiber products and particleboard. Ninety-nine percent of the 17 million cubic feet of sawdust and bark were used for industrial fuel.

Pulpwood. Bark was the only residue associated with roundwood pulpwood. Bark volumes reported from the eight pulpmills in South Carolina totaled 35 million cubic feet; most was used for fuel by the same mills that produced it. Bark from roundwood pulpwood accounted for 53 percent of the total bark volume at all primary mills and 16 percent of the State's total residues produced.

Other industrial. Residues of all types from other industrial products totaled 5 million cubic feet, 2 percent of South Carolina's total mill residue volume. Coarse residues of nearly 2 million cubic feet were used mainly for industrial fuel and sawn products. Bark residues, totaling 3 million cubic feet, were used for industrial fuel and miscellaneous uses.

Regional Trends

Between 1992 and 1994, total output of industrial roundwood products increased across all regions of South Carolina; the Piedmont region had the largest increase, 31 percent. Output for all softwood products was down in all regions, except the Piedmont, while output of all hardwood products increased substantially in all regions. Changes in output varied considerably by product and by region; however, softwood accounted for 76 percent or more of industrial roundwood products in all regions.

Southern Coastal Plain Region

Roundwood output from the 12 counties of the Southern Coastal Plain region totaled 182 million cubic feet in 1994, a 5-percent increase since 1992 (table 15). A 1-percent decline in softwood output was more than offset by a 29-percent increase in hardwood production. Both softwood saw logs and softwood other industrial output showed declines in this region, 11 and 32 percent, respectively. Conversely, softwood veneer output had a threefold increase and softwood pulpwood production was up 10 percent. Hardwood production increased in all categories. Seventy-eight percent of the total roundwood TPO was softwood.

The Southern Coastal Plain was the only region where saw-log production exceeded pulpwood production. Saw-log production declined 8 percent to 87 million cubic feet and accounted for 48 percent of the region's total roundwood output. This figure represents 33 percent of the State's total saw-log output. Pulpwood production of nearly 85 million cubic feet accounted for 46 percent of the region's total TPO, 25 percent of the State's total roundwood pulpwood output. Total veneer production more than doubled to 9 million cubic feet, nearly 20 percent of the State's total veneer production. Twenty-nine percent of the State's other industrial products also came from this region. Of the 12 counties in this area, 3 produced more than 20 million cubic feet, 7 produced between 10 and 20 million cubic feet, 1 produced between 5 and 10 million cubic feet, and 1 produced less than 5 million cubic feet (table 16). In the Southern Coastal Plain region, 32 primary wood-using plants were operating during 1994, 2 less than in 1992: 21 sawmills, 6 veneer or plywood mills, 3 pole, and 2 post mills (fig. 10). These mills processed 28 percent of the State's total roundwood output.

Northern Coastal Plain Region

Roundwood output from the 16 counties of the Northern Coastal Plain region totaled 215 million cubic feet in 1994, a 1 -percent increase since 1992 (table 17). Total softwood output declined 2 percent,

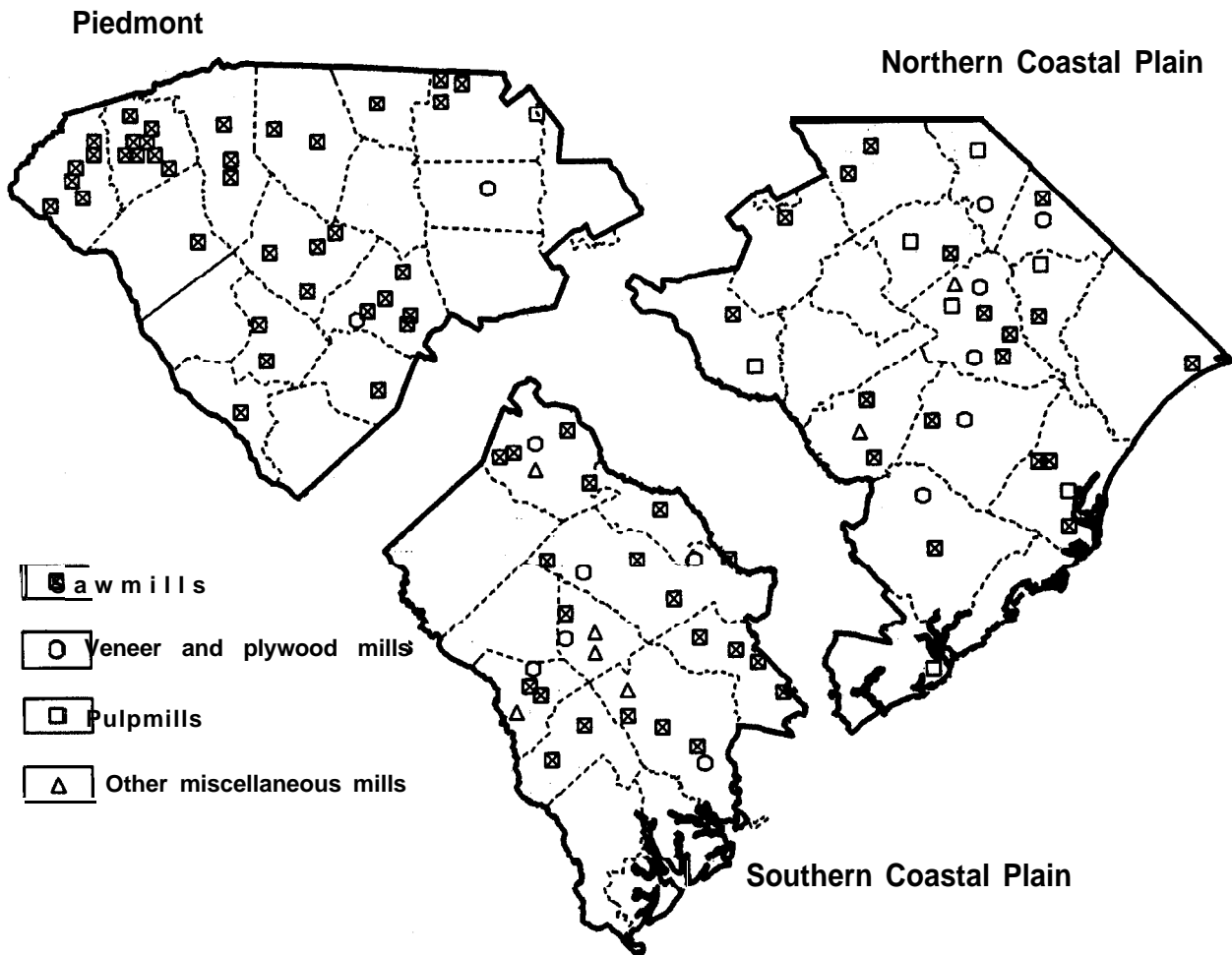


Figure 10-Primary wood-using mills by regions.

whereas total hardwood output increased 14 percent in the region. Softwood production declined in all areas except pulpwood; hardwood production increased in all areas except veneer. Seventy-nine percent of the total roundwood TPO was softwood.

Pulpwood was the leading product in the Northern Coastal Plain region. Pulpwood production of 116 million cubic feet accounted for 54 percent of the region's total TPO and for 35 percent of the State's total roundwood pulpwood output. Saw-log production for both softwoods and hardwoods was down nearly 7 percent to 82 million cubic feet. This figure represents 38 percent of the region's total roundwood output and 31 percent of the State's total saw-log output. Despite a 5-percent decline in total veneer production, 32 percent of the veneer logs harvested in South Carolina during 1994 came from the Northern

Coastal Plain region; in addition, 29 percent of the State's other industrial products came from this region. Of the 16 counties in this area, 3 produced more than 20 million cubic feet, 7 produced between 10 and 20 million cubic feet, 5 produced between 5 and 10 million cubic feet, and 1 produced less than 5 million cubic feet (table 18). The Northern Coastal Plain region had 33 primary wood-using plants operating during 1994, 4 less than in 1992: 7 pulpmills, 18 sawmills, 6 veneer or plywood mills, and 2 pole mills. These mills processed 33 percent of the State's total roundwood output.

Piedmont Region

In 1994, 255 million cubic feet of roundwood were produced in the 18 counties making up the Piedmont region of South Carolina. This total reflects an

increase of 31 percent between 1992 and 1994 (table 19). The region ranks first in the State in the production of roundwood products, at 39 percent of the total output. Both softwood and hardwood output totals increased for the region; softwood output was up by 30 percent and hardwood production was up 34 percent.

Production increased in each product and species group in 1994. Production of pulpwood was up by 28 percent to nearly 134 million cubic feet and accounted for 52 percent of the region's total roundwood output. Total veneer-log production was up 66 percent to 24 million cubic feet and accounted for 9 percent of the region's total roundwood production. Saw-log production was up 28 percent to 95 million cubic feet and accounted for 37 percent of the total roundwood production for this area. This region produced 36 percent of the State's saw logs, 49 percent of the veneer logs, 40 percent of the pulpwood, and 42 percent of the roundwood used for other industrial products. Four counties in the 18-county area produced more than 20 million cubic feet, 7 counties produced between 10 and 20 million cubic feet, and 7 counties produced between 5 and 10 million cubic feet (table 20). The Piedmont region had 40 primary wood-using plants operating in 1994, the same as in 1992: 1 pulpmill, 37 sawmills, and 2 veneer or plywood plants.

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Definitions

Board feet. Unit of measure applied to roundwood. It relates to lumber that is 1-foot long, 1-foot wide, and 1 -inch thick (or its equivalent).

Composite panels. Consists of structural panels (oriented strand board or waferboard), particleboard (industrial underlayment, thin panelboard).

Consumption. The quantity of a commodity, such as pulpwood, utilized.

Drain. The volume of roundwood removed from any geographic area where timber is grown.

Exports. The volume of roundwood utilized by mills outside the State where timber was cut.

Imports. The volume of roundwood delivered to a mill or group of mills in a specific State but harvested from outside that particular area.

Industrial fuelwood. A roundwood product, with or without bark, used to generate energy at a manufacturing facility such as a wood-using mill.

Industrial roundwood products. Any primary use of the main stem of a tree, such as saw logs, poles, pilings, veneer logs, pulpwood, posts, or cooperage logs.

Log. A primary forest product harvested in long, primarily 8-foot lengths.

Plant residues. Wood material generated in the production of timber products at primary manufacturing plants.

Coarse residues. Suitable for chipping such as slabs, edgings, trim, veneer cores, and ends.

Fine residues. Not suitable for chipping such as sawdust, shavings, and veneer clippings.

Primary wood-using plants. Industries that receive roundwood or chips from roundwood for the manufacture of products such as veneer, pulp, and lumber.

Production. The total volume of roundwood harvested from land within the specified State, regardless of where consumed. Production is the sum of timber harvested and used within the State, plus all roundwood exported to other U.S. States.

Pulpwood. A roundwood product that will be reduced to individual wood fibers by chemical or mechanical means. The fibers are used to make a broad generic group of pulp products that includes paper products as well as chipboard, fiberboard, insulating board, and paperboard.

Receipts. The quantity or volume of industrial roundwood received at a mill or by a group of mills in a State, regardless of the geographic source. Volume of roundwood receipts is equal to the volume of roundwood retained in a State plus roundwood imported from other States in the United States.

Retained. Roundwood volume harvested from and processed by mills within the same State.

Roundwood. Logs, bolts, or other round sections cut from trees for industrial manufacture or consumer use.

Roundwood chipped. Any timber cut primarily for industrial manufacture, delivered to nonpulp mills, chipped, and then sold to pulpmills for use as fiber. Includes tops, jump sections, and whole trees.

Roundwood product drain. That portion of total drain used for a product.

Saw log. A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, sound and straight, and with minimum diameter inside bark of 8 inches for softwoods and 8 inches for hardwoods.

Standard cord. A unit measure applied to roundwood, usually bolts or split wood. It relates to a stack of wood 4 feet high, 4 feet wide, and 8 feet long—encompassing 128 cubic feet of wood, bark, and air space. In Florida, this usually translates to 74.8 cubic feet of solid wood for pulpwood, since pulpwood is more uniform.

Timber products output. Roundwood production in an area's forests (equals roundwood product drain).

Timber removals. The merchantable volume of trees removed from the timberland inventory by harvesting, cultural operations such as stand improvement, land clearing, or changes in land use.

Veneer log. Logs to be used in the production of plywood, finished panels, or veneer sheets, both rotary cut and sliced.

Conversion Factors'

Saw Logs

Softwood	0.18018 cubic foot = 1 board foot 5.55 board feet = 1 cubic foot
Hardwood	0.18531 cubic foot = 1 board foot 8.05 board feet = 1 cubic foot

Veneer Logs

Softwood	0.17493 cubic foot = 1 board foot 5.72 board feet = 1 cubic foot
Hardwood	0.18050 cubic foot = 1 board foot 8.23 board feet = 1 cubic foot

Pulpwood^b

Softwood	70.50 cubic feet/cord
Hardwood	70.50 cubic feet/cord

^a Conversion factors vary with stem size (d.b.h.) and species.

The factors shown are for trees of average diameters removed in South Carolina during the latest survey period.

^b Cubic feet of solid wood per cord.

**Table 1 -Output of industrial products, by product and species group,
South Carolina, 1992 and 1994**

Product and species group	Year		Change	Percent change
	1992	1994		
Thousand cubic feet				
Saw logs				
Softwood	231,538	229,978	-1,580	-0.7
Hardwood	25,519	34,510	8,991	35.2
Total	257,057	264,488	7,431	2.9
Veneer logs				
Softwood	29,643	41,957	12,314	41.5
Hardwood	6,238	7,680	1,442	23.1
Total	35,881	49,637	13,756	38.3
Pulpwood ¹				
Softwood	205,596	238,111	32,515	15.8
Hardwood	78,661	96,074	17,413	22.1
Total	284,257	334,185	49,928	17.6
Composite panels				
Softwood	0	7	7	—
Hardwood	0	37	37	—
Total	0	44	44	—
Other industrial				
Softwood	5,267	4,800	-467	-8.9
Hardwood	0	0	0	—
Total	5,267	4,800	-467	-8.9
All industrial				
Softwood	472,044	514,853	42,809	9.1
Hardwood	110,418	138,301	27,883	25.3
Total	582,462	653,154	70,692	12.1
Byproduct output				
Softwood	165,240	177,563	12,323	7.5
Hardwood	28,992	33,306	4,314	14.9
Total	194,232	210,869	16,637	8.6
Total output				
Softwood	637,284	692,418	55,132	8.7
Hardwood	139,410	171,607	32,197	23.1
Total	776,694	864,023	87,329	11.2

— = negligible.

^a Includes roundwood that was delivered to nonpulp mills and then chipped and sold to pulp mills (10,850,000 cubic feet in 1992 and 13,034,000 cubic feet in 1994).

Table 2—Roundwood receipts, by product and species group, South Carolina, 1992 and 1994

Product and species group	Year		Change	Percent change
	1992	1994		
Thousand cubic feet				
Saw logs				
Softwood	220,705	221,594	889	0.4
Hardwood	27,918	29,255	1,337	4.8
Total	248,623	250,849	2,226	0.9
Veneer logs				
Softwood	24,930	41,705	16,775	67.3
Hardwood	6,593	8,653	2,060	31.2
Total	31,523	50,358	18,835	59.8
Pulpwood'				
Softwood	216,309	251,767	35,458	16.4
Hardwood	78,275	95,204	16,929	21.6
Total	294,584	346,971	52,387	17.8
Composite panels				
Softwood	0	0	0	—
Hardwood	0	0	0	—
Total	0	0	0	—
Other industrial				
Softwood	5,330	3,525	-1,805	-33.9
Hardwood	0	0	0	
Total	5,330	3,525	-1,805	-33.9
Total output				
Softwood	467,274	518,591	51,317	11.0
Hardwood	112,786	133,112	20,326	18.0
Total	580,060	651,703	71,643	12.4

— = negligible.

^a Includes roundwood that was delivered to nonpulp mills and then chipped and sold to pulp mills (10,765,000 cubic feet in 1992 and 14,906,000 cubic feet in 1994).

Table 3—Number of primary wood-using plants, by industry, South Carolina, 1977-1994

Industry	Year							
	1977	1979	1983	1985	1987	1989	1992	1994
Sawmills	119	128	113	118	99	87	79	76
Veneer mills	23	24	21	21	20	17	14	14
Pulpmills	7	7	8	8	8	8	9	8
Composite panel mills	0	0	0	0	0	0	0	0
Other mills	5	4	6	8	6	5	9	7
All plants	154	163	148	155	133	117	111	105

Table 4—Roundwood receipts, by sawmill size, South Carolina, 1992 and 1994

Sawmill size class" (million board feet)	1992			1994		
	Number of mills	Thousand board feet	Percent of volume	Number of mills	Thousand board feet	Percent of volume
< 1.0	15	8,987	1	10	5,135	
1.0 - 4.99	20	53,561	4	24	65,481	5
5.0 - 9.99	16	111,753	8	13	90,073	6
10.0 - 49.99	18	334,787	24	20	394,858	28
> 50	10	886,257	63	9	856,814	61
Total	79	1,395,345	100	76	1,412,361	100

— = negligible.

^a Based on volume received as opposed to actual capacity.

Table 5—Roundwood receipts, by species and type of mill, South Carolina, 1994

Species	Type of mill						
	All	Sawmills	Veneer mills		OS6 and panels'	Pulpmills ^b	Other mills
	mills		Pine plywood	Other veneer			
			Thousand cubic feet				
Softwood							
Yellow pine	266,028	220,798	41,685	20	0	NA	3,525
Eastern white pine	121	121	0	0	0	NA	0
Cedar	32	32	0	0	0	NA	0
Cypress	643	643	0	0	0	NA	0
Other softwood	0	0	0	0	0	NA	0
Unclassified	251,767	0	0	0	0	251,767	0
Total softwoods	518,591	221,694	41,685	20	0	251,767	3,525
Hardwood							
Blackgum and tupelo	1,072	608	276	188	0	NA	0
Soft maple	1,059	837	0	222	0	NA	0
Sweetgum	8,155	5,342	553	2,260	0	NA	0
Yellow-poplar	9,072	5,143	2,744	1,185	0	NA	0
Other soft hardwood	323	293	0	30	0	NA	0
Hickory	357	322	0	35	0	NA	0
Red oak	10,396	9,780	97	519	0	NA	0
White oak	6,251	5,833	85	333	0	NA	0
Other hard hardwood	1,223	1,097	0	126	0	NA	0
Unclassified	95,204	0	0	0	0	95,204	0
Total hardwoods	133,112	29,255	3,755	4,898	0	95,204	0
All species	651,703	250,849	45,440	4,918	0	346,971	3,525

NA = not applicable.

^a OSB = oriented strand board.

^b Only collected by softwood and hardwood and includes roundwood chipped.

Table 6 -Industrial roundwood movement, by year and species group, South Carolina, 1992 and 1994

Year	Production	Exported to other States	Retained	Imported from other States	Receipts
<i>Thousand cubic feet</i>					
SOFTWOOD					
1992	472,044	77,908	394,138	73,138	487,274
1994	514,853	78,228	438,827	81,984	518,591
HARDWOOD					
1992	110,418	23,558	88,880	25,928	112,788
1994	138,301	37,157	101,144	31,988	133,112
ALL SPECIES					
1992	582,482	101,484	480,998	99,082	580,080
1994	853,154	115,383	537,771	113,932	851,703

Table 7-Industrial roundwood movement, by product and species group, South Carolina, 1994

Product and species group	Production	Exported to other States	Retained	Imported from other States	Receipts
<i>Thousand cubic feet</i>					
Saw logs					
Softwood	229,978	23,534	208,444	15,150	221,594
Hardwood	34,510	7,468	27,042	2,213	29,255
Total	264,488	31,002	233,486	17,363	250,849
Veneer logs					
Softwood	41,957	4,015	37,942	3,763	41,705
Hardwood	7,680	554	7,126	1,527	8,653
Total	49,637	4,569	45,068	5,290	50,358
Pulpwood^a					
Softwood	23,811	49,087	189,024	62,743	251,767
Hardwood	96,074	29,098	66,976	28,228	95,204
Total	334,185	78,185	256,000	90,971	346,971
Composite panels					
Softwood	7	7	0	0	0
Hardwood	37	37	0	0	0
Total	44	44	0	0	0
Other industrial					
Softwood	4,800	1,583	3,217	308	3,525
Hardwood	0	0	0	0	0
Total	4,800	1,583	3,217	308	3,525
All products					
Softwood	514,853	78,226	436,627	81,964	518,591
Hardwood	138,301	37,157	101,144	31,968	133,112
Total	653,154	115,383	537,771	113,932	651,703

^a Includes roundwood chipped.

**Table 8-Saw-log volume, by destination, source, and species group,
South Carolina, 1994**

Destination and source	All species	Species group	
		Softwood	Hardwood
Thousand cubic feet			
South Carolina (retained)	233,406	206,444	27,042
Exports to:			
Georgia	18,629	18,507	122
North Carolina	12,373	5,027	7,346
Total	31,002	23,534	7,468
Imports from:			
Georgia	7,172	5,905	1,267
Kentucky	34	0	34
Mississippi	34	0	34
North Carolina	10,089	9,245	a44
Tennessee	34	0	34
Total	17,363	15,150	2,213

**Table O-Veneer volume, by destination, source, and species group,
South Carolina, 1994**

Destination and source	All species	Species group	
		Softwood	Hardwood
Thousand cubic feet			
South Carolina (retained)	45,068	37,942	7,126
Exports to:			
Georgia	203	0	203
North Carolina	4,366	4,015	351
Total	4,569	4,015	554
Imports from:			
Georgia	1,514	1,109	405
North Carolina	3,776	2,654	1,122
Total	5,290	3,763	1,527

Table 10—Pulpwood volume, by destination, source, and species group,
South Carolina, **1994^a**

Destination and source	All species	Species group	
		Softwood	Hardwood
Thousand cubic feet			
South Carolina (retained)	256,000	169,024	66,976
Exports to:			
Arkansas	53	0	53
Florida	677	877	0
Georgia	50,477	27,595	22,882
Kentucky	159	0	159
North Carolina	26,463	20,615	5,848
Ohio	53	0	53
Pennsylvania	103		103
Total	78,185	49,087	29,098
Imports from:			
Alabama	2	2	0
Georgia	1,354	156	1,198
Mississippi	5	0	5
North Carolina	88,920	62,020	26,900
Virginia	690	565	125
Total	90,971	62,743	28,228

^a Includes roundwood chipped that was delivered to nonpulpmills and then chipped and sold to pulpmills.

Table 11 -Composite panel volume, by destination, source, and species group,
South Carolina, **1994**

Destination and source	All species	Species group	
		Softwood	Hardwood
Thousand cubic feet			
South Carolina (retained)	0	0	0
Exports to:			
North Carolina	44	7	37
Total	44	7	37

**Table 12—Other industrial volume, by destination, source, and species group,
South Carolina, 1994**

Destination and source	All species	Species group	
		Softwood	Hardwood
Thousand cubic feet			
South Carolina (retained)	3,217	3,217	0
Exports to:			
Georgia	1,343	1,343	0
North Carolina	235	235	0
Virginia	5	5	0
Total	1,583	1,583	0
imports from:			
Georgia	107	107	0
North Carolina	201	201	0
Total	308	308	0

Table 13—Primary mill residue volume, by roundwood type, species group, and residue type, South Carolina, 1994

Roundwood type and species group	All types	Residue type			
		Bark	Coarse	Sawdust	Shavings
Thousand cubic feet					
Saw logs					
Softwood	123,822	19,384	54,227	32,258	17,953
Hardwood	18,835	3,197	7,330	5,871	237
Total	140,457	22,581	81,557	38,129	18,190
Veneer logs					
Softwood	25,288	3,752	11,290	10,228	0
Hardwood	5,982	989	2,508	2,505	0
Total	31,250	4,721	13,798	12,731	0
Pulpwood					
Softwood	23,898	23,898	0	0	0
Hardwood	10,914	10,914	0	0	0
Total	34,812	34,812	0	0	0
Composite panels					
Softwood	0	0	0	0	0
Hardwood	0	0	0	0	0
Total	0	0	0	0	0
Other industrial"					
Softwood	4,624	3,127	1,497	0	0
Hardwood	0	0	0	0	0
Total	4,624	3,127	1,497	0	0
Total					
Softwood	177,612	50,181	67,014	42,484	17,953
Hardwood	33,531	15,080	9,838	8,376	237
Total	211,143	65,241	76,852	50,860	18,190

^a Includes poles, pilings, posts, and other industrial products.

Table 14—**Disposal of residue** at primary Wood-using plants, by product, species group, and type of residue,
South Carolina, 1992 and 1994

Product and species group	All types		Bark		Coarse		Sawdust		Shavings	
	1992	1994	1992	1994	1992	1994	1992	1994	1992	1994
<i>Thousand cubic feet</i>										
Fiber products										
Softwood	58,293	61,116	0	0	57,060	61,116	1,101	0	132	0
Hardwood	7,564	8,454	0	0	7,564	8,454	0	0	0	0
Total	65,857	69,570	0	0	64,624	69,570	1,101	0	132	0
Psticleborrd										
Softwood	11,894	20,593	0	0	906	2,510	1,760	5,957	9,228	12,126
Hardwood	197	448	0	0	0	355	0	0	197	93
Total	12,091	21,041	0	0	906	2,865	1,760	5,957	9,425	12,219
Composite panels										
Softwood	0	0	0	0	0	0	0	0	0	0
Hardwood	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0
Sswn products										
Softwood	217	568	0	0	217	484	0	0	0	74
Hardwood	95	0	0	0	95	0	0	0	0	0
Total	312	568	0	0	312	494	0	0	0	74
Fuel										
Softwood	83,043	81,567	40,372	43,135	4,502	2,671	32,269	32,748	5,900	3,012
Hardwood	19,761	23,045	11,899	14,012	727	981	7,034	7,836	101	116
Total	102,804	104,612	52,271	57,147	5,229	3,652	39,303	40,685	6,001	3,128
Miscellaneous										
Softwood	11,793	13,719	5,632	7,018	184	194	2,675	3,770	3,302	2,737
Hardwood	1,375	1,359	894	890	45	45	427	410	9	14
Total	13,168	15,078	6,526	7,908	229	238	3,102	4,180	3,311	2,751
Not used										
Softwood	1,028	48	836	8	33	29	146	8	13	4
Hardwood	132	225	32	178	69	3	31	30	0	14
Total	1,160	274	868	186	102	32	177	38	13	18
All products										
Softwood	166,268	177,612	46,840	50,161	62,902	67,014	37,951	42,484	18,575	17,953
Hardwood	29,124	33,531	12,825	15,080	8,500	9,838	7,492	8,376	307	237
Total	195,392	211,143	59,665	65,241	71,402	76,852	45,443	50,860	18,882	18,190

Table 1 **5—Roundwood** timber products output, by product and species group, Southern Coastal Plain of South Carolina, 1992 and 1994

Product and species group	Year		Change	Percent change
	1992	1994		
Thousand cubic feet				
Saw logs				
Softwood	80,938	77,496	-9,442	-10.9
Hardwood	7,660	9,574	1,914	25.0
Total	94,598	87,070	-7,528	-8.0
Veneer logs				
Softwood	1,852	5,467	3,615	195.2
Hardwood	2,428	3,891	1,463	60.3
Total	4,280	9,358	5,078	118.6
Pulpwood'				
Softwood	52,393	57,771	5,378	10.3
Hardwood	21,096	26,748	5,652	26.8
Total	73,489	84,519	11,030	15.0
Composite panels				
Softwood	0	0	0	—
Hardwood	0	0	0	—
Total	0	0	0	
Other industrial				
Softwood	2,053	1,399	-654	-31.9
Hardwood	0	0	0	—
Total	2,053	1,399	-654	-31.9
All industrial				
Softwood	143,236	142,133	-1,103	-0.8
Hardwood	31,184	40,213	9,029	29.0
Total	174,420	182,346	7,926	4.5

— = negligible.

^a Includes roundwood that was delivered to nonpulp mills and then chipped and sold to pulp mills (4,976,000 cubic feet in 1992 and 3,041,000 cubic feet in 1994).

Table 16—Roundwood timber products output, by county, product and species group, Southern Coastal Plain of South Carolina. 1994

County	All products		Saw logs		Veneer logs		Pulpwood ^a		Composite panels		Other industrial	
	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
<i>Thousand cubic feet</i>												
Aiken	13,506	2,610	6,234	324	0	41s	7,003	2,067	0	0	269	0
Allendale	6,693	2,541	4,420	1,031	0	359	4,240	1,151	0	0	33	0
Bamberg	6,764	2,646	6,022	753	0	346	2,692	1,547	0	0	70	0
Barnwell	10,837	3,495	5,803	470	0	592	5,001	2,433	0	0	33	0
Beaufort	5,996	1,329	2,094	0	0	1	3,776	1,328	0	0	126	0
Calhoun	4,044	937	1,134	22	1,382	159	1,489	7 5 8	0	0	3 9	0
Colleton	20,889	7,284	14,203	4,284	0	511	6,578	2,489	0	0	108	0
Dorchester	13,721	2,469	6,165	1,037	2,350	167	5,183	1,265	0	0	43	0
Hampton	17,142	4,007	8,597	331	0	348	8,396	3,330	0	0	149	0
Jasper	15,999	1,937	11,963	85	0	34	3,871	1,838	0	0	165	0
Lexington	8,937	2,088	4,662	207	353	26	3,654	1,853	0	0	268	0
Orangeburg	13,585	8,892	6,199	1,050	1,382	931	5,908	6,711	0	0	96	0
All counties	142,133	40,213	77,498	9,574	5,487	3,891	57,771	26,748	0	0	1,399	0

^a Includes roundwood that was delivered to nonpulpmills and then chipped and sold to pulpmills (3,041,000 cubic feet in 1994).

**Table 17—Roundwood timber products output, by product and species group;
Northern Coastal Plain of South Carolina, 1992 and 1994**

Product and species group	Year		Change	Percent change
	1992	1994		
Thousand cubic feet				
Saw logs				
Softwood	81,629	71,081	-10,548	-12.9
Hardwood	6,541	11,101	4,560	69.7
Total	88,170	82,182	-5,988	-6.8
Veneer logs				
Softwood	15,293	14,486	-807	-5.3
Hardwood	1,739	1,633	-106	-6.1
Total	17,032	16,119	-913	-5.4
Pulpwood'				
Softwood	74,795	83,129	8,334	11.1
Hardwood	31,474	32,521	1,047	3.3
Total	106,269	115,650	9,381	8.8
Composite panels				
Softwood	0	0	0	—
Hardwood	0	0	0	
Total	0	0	0	
Other industrial				
Softwood	1,533	1,380	-153	-10.0
Hardwood	0	0	0	—
Total	1,533	1,380	-153	-10.0
All industrial				
Softwood	173,250	170,076	-3,174	-1.8
Hardwood	39,754	45,255	5,501	13.8
Total	213,004	215,331	2,327	1.1

— = negligible.

^a Includes roundwood that was delivered to nonpulp mills and then chipped and sold to pulp mills (3,094,000 cubic feet in 1992 and 2,765,000 cubic feet in 1994).

Table 18—Roundwood timber products output, by county, product and species group, Northern Coastal Plain of South Carolina, 1994

County	All products		Saw logs		Veneer logs		Pulpwood ^a		Composite panels		Other industrial	
	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
<i>Thousand cubic feet</i>												
Berkeley	11,442	827	5,327	323	1,382	0	4,733	504	0	0	0	0
Charleston	5,309	1,108	989	500	0	0	4,307	608	0	0	13	0
Chesterfield	11,571	5,188	3,702	481	0	64	7,869	4,643	0	0	0	0
Clarendon	4,777	1,629	1,489	627	1,106	219	2,182	763	0	0	0	0
Darlington	4,236	5,471	1,725	3,769	803	163	1,608	1,539	0	0	100	0
Dillon	6,211	2,961	2,830	374	843	30	1,424	2,557	0	0	114	0
Florence	12,026	4,769	6,902	1,943	16	162	4,929	2,664	0	0	179	0
Georgetown	20,896	1,849	7,160	4	2,350	7	11,124	1,838	0	0	262	0
Horry	23,499	4,907	12,318	512	2,530	114	8,214	4,281	0	0	437	0
Kershaw	16,688	2,869	4,348	924	0	0	12,112	1,945	0	0	128	0
Lee	1,357	583	443	0	0	0	914	583	0	0	0	0
Marion	13,021	3,443	7,298	555	321	200	5,339	2,688	0	0	63	0
Marlboro	8,130	3,203	3,841	482	1,124	136	3,165	2,585	0	0	0	0
Richland	8,147	2,295	2,843	46	1,124	407	4,180	1,842	0	0	0	0
Sumter	3,741	1,408	1,151	166	118	0	2,472	1,242	0	0	0	0
Williamsburg	20,125	2,745	8,715	395	2,769	131	8,557	2,219	0	0	84	0
All counties	170,076	45,255	71,081	11,101	14,486	1,633	83,129	32,521	0	0	1,380	0

^a Includes roundwood that was delivered to nonpulpmills and then chipped and sold to pulpmills (2,765,000 cubic feet in 1994).

Table 19—Roundwood timber products output, by product and species group, Piedmont of South Carolina, 1992 and 1994

Product and species group	Year		Change	Percent change
	1992	1994		
Thousand cubic feet				
Saw logs				
Softwood	82,971	81,401	18,430	29.3
Hardwood	11,318	13,835	2,517	22.2
Total	74,289	95,238	20,947	28.2
Veneer logs				
Softwood	12,498	22,004	9,508	78.1
Hardwood	2,071	2,158	85	4.1
Total	14,589	24,180	9,591	85.8
Pulpwood ^a				
Softwood	78,408	97,211	18,803	24.0
Hardwood	28,091	38,805	10,714	41.1
Total	104,499	134,018	29,517	28.2
Composite panels				
Softwood	0	7	0	—
Hardwood	0	37	0	
Total	0	44	0	—
Other industrial				
Softwood	1,881	2,021	340	20.2
Hardwood	0	0	0	
Total	1,881	2,021	340	20.2
All industrial				
Softwood	155,558	202,844	47,088	30.3
Hardwood	39,480	52,833	13,353	33.8
Total	195,038	255,477	80,439	31.0

— = negligible.

^a includes roundwood that was delivered to nonpulp mills and then chipped and sold to pulp mills (2,780,000 cubic feet in 1992 and 7,228,000 cubic feet in 1994).

Table PO-Roundwood timber products output, by county, product and species group, Piedmont of South Carolina, **1994**

County	All products		Saw logs		Veneer logs		Pulpwood*		Composite panels		Other industrial	
	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood	Softwood	Hardwood
	<i>Thousand cubic feet</i>											
Abbeville	7,322	2,656	4,078	711	0	40	2,683	1,905	0	0	561	0
Anderson	4,797	2,385	2,693	1,652	353	40	1,190	693	0	0	561	0
Cherokee	5,746	1,362	942	858	589	0	4,215	504	0	0	0	0
Chester	16,684	3,919	3,705	425	2,721	392	10,202	3,065	7	37	49	0
Edgefield	17,627	2,683	11,230	0	235	0	5,997	2,683	0	0	165	0
Fairfield	24,443	3,148	9,729	133	3,782	352	10,840	2,663	0	0	92	0
Greenville	4,033	2,820	1,209	1,431	803	172	2,021	1,217	0	0	0	0
Greenwood	13,203	2,923	6,648	381	1,832	168	4,696	2,374	0	0	27	0
Lancaster	6,538	1,869	1,133	238	0	0	5,405	1,631	0	0	0	0
Laurens	15,701	2,934	6,874	1,459	2,893	168	5,934	1,307	0	0	0	0
McCormick	11,001	1,808	7,096	222	471	0	3,407	1,586	0	0	27	0
Newberry	20,462	8,847	7,851	747	2,004	21	10,351	8,079	0	0	256	0
Oconee	6,523	2,622	2,596	1,318	0	40	3,927	1,264	0	0	0	0
Pickens	4,248	3,470	3,008	2,357	471	40	769	1,073	0	0	0	0
Saluda	11,601	1,459	6,185	24	1,179	35	4,009	1,400	0	0	228	0
Spartanburg	12,493	3,691	1,816	897	1,039	175	9,638	2,619	0	0	0	0
Union	10,564	2,421	2,948	270	1,393	193	6,168	1,958	0	0	55	0
York	9,658	1,816	1,660	712	2,239	320	5,759	784	0	0	0	0
All counties	202,644	52,833	81,401	13,835	22,004	2,156	97,211	36,805	7	37	2,021	0

* Includes roundwood that was delivered to nonpulpmills and then chipped and sold to pulpmills (7,228,000 cubic feet in 1994).

Howell, Michael. 1996. South Carolina's timber industry-an assessment of timber product output and use, 1994. Resour. Bull. SRS-7. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 27 p.

In 1994, volume of roundwood products removed from South Carolina's forests totaled 653 million cubic feet- 12 percent more than in 1992. Mill byproducts generated from primary manufacturers increased 9 percent to 211 million cubic feet. Almost all plant residues were used, primarily for fuel and fiber products. Pulpwood was the leading roundwood product at 334 million cubic feet; saw logs ranked second at 264 million cubic feet; veneer logs were third with 50 million cubic feet. The number of primary processing plants declined from 111 in 1992 to 105 in 1994. Total receipts increased 12 percent to 652 million cubic feet.

KEYWORDS: Roundwood, residues, pulpwood, saw logs, veneer logs, wood movement.



The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

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Southern Research Station

Established 1921

The Southern Research Station, headquartered in Asheville, North Carolina, is one of the seven regional Stations and the Forest Products Laboratory that make up the Forest Service research organization.

RESEARCH MISSION:

To acquire the knowledge, develop the technology, and disseminate the research findings required to manage the Southern forest resources in ways that satisfy demands of goods and services while maintaining a quality environment.